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# Electronic Switched Network interworking

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The Electronic Switched Network (ESN) operates within ISDN, supporting Network Class of Service (NCOS) capability. The tables in this module describe which ESN features are available over ISDN and illustrate ESN capabilities over ISDN.

Network Class Of Service (NCOS) information is embedded in SETUP messages, and provides the means to control a user's eligibility for the following:

- access routes
- access queuing
- receive Expensive Route Warning Tone (ERWT)
- access network speed call

When NCOS information, which includes Traveling Class of Service (TCOS) information, is sent to a DMS-100, the DMS switch can provide access to AT&Ts Electronic Tandem Network (ETN).

For a general description of ESN operations and features, see *Meridian 1 system overview* (553-3001-100) or *X11 features and services* (553-3001-305).

### **ESN translation**

Currently, a Meridian 1 switch with a BARS or NARS package can have two (or one) separate ESN translators for handling BARS/NARS calls. NARS can have two translators and BARS can have only one translator (AC1). This is in addition to its standard translator, which handles all other call types. Each NARS/BARS translator has its access code (ESN AC1/AC2), which is defined on the standard translator. The remaining digits, for example, NPA, NXX, LOC, and SPN, are defined on the NARS/BARS translator.

Therefore, a receiving switch must determine which translator to use and insert the needed NARS/BARS access code (unless the receiving number is complete, that is, it includes the proper NARS/BARS access code in its digit stream already). This can be done by configuring an ESN digit manipulation to insert the ESN access code in the sending switch.

To insert the needed BARS/NARS access code in the receiving switch, two route options in LD 16 can be used:

- INST: An incoming route option that inserts the specified digits(s) to the incoming digit stream for all the calls received on that route.
- INAC: An incoming ISDN route option that inserts the needed NARS/BARS access code to the incoming digit stream. The insertion is based on the Type of Number of the received Called Number Information Element, bypassing the digit insertion (INST) of the route. The AC2 option in LD 15 provides a mapping between the incoming Type of Number and the desired translator. This is used to determine which NARS/BARS access code is inserted.

### **ESN access code configuration with X11 release 14 and earlier**

With Meridian 1 ISDN network configurations prior to X11 release 14, the ESN access code is inserted in one of the following ways:

- The originating PBX is configured with Digit Manipulation Index (DMI, LD 86) to insert and send the ESN access code.
- The receiving PBX inserts the ESN access code in the Route Data Block (RDB, LD 16) under the INST (Insert) prompt.

**ESN access code configuration with package 148 and X11 release 15 and later**

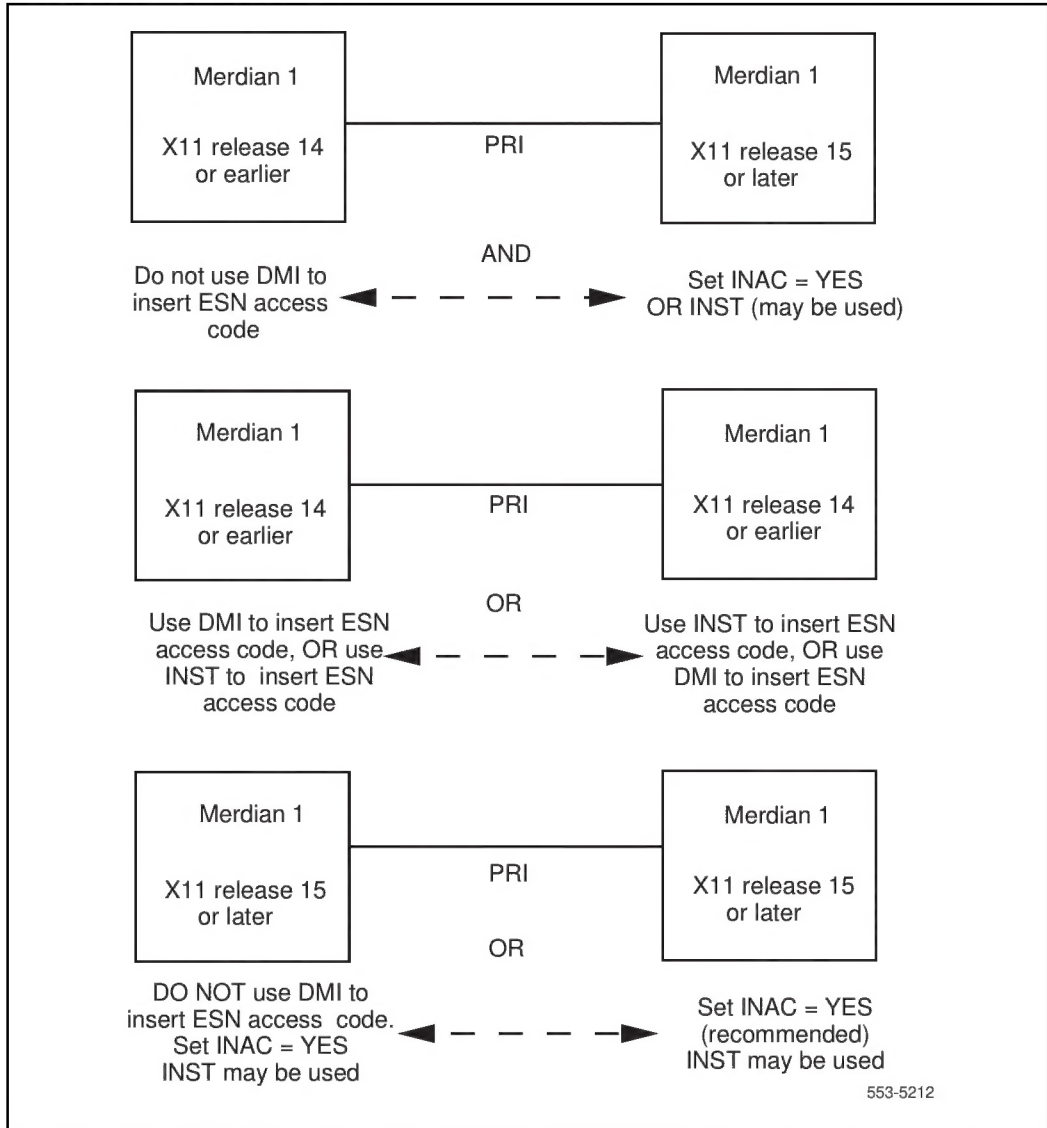
For Meridian 1 configurations of X11 release 15 and later that utilize ISDN networking features, ESN access code insertion must be performed on the receiving Meridian 1. The originating Meridian 1 must not use digit manipulation to insert and send the ESN access code to the terminating Meridian 1.

Therefore, in order to accomplish networking feature transparency (requiring package 148), the ESN access code insertion must be performed in the receiving Meridian 1, either by means of the INST prompt (X11 release 14 and earlier) or the INAC prompt (X11 release 15 and later) in LD 16. Although the INST or the INAC prompt can be used in X11 release 15 and later, the INAC prompt is the recommended method.

When the PBX is upgraded from X11 release 14 to X11 release 15 or later, the above database conversion is required to allow networking applications (such as NRAG) to function properly.

Figure 29 summarizes these database configuration rules. Figure 30 shows the ESN capability within an ISDN network.

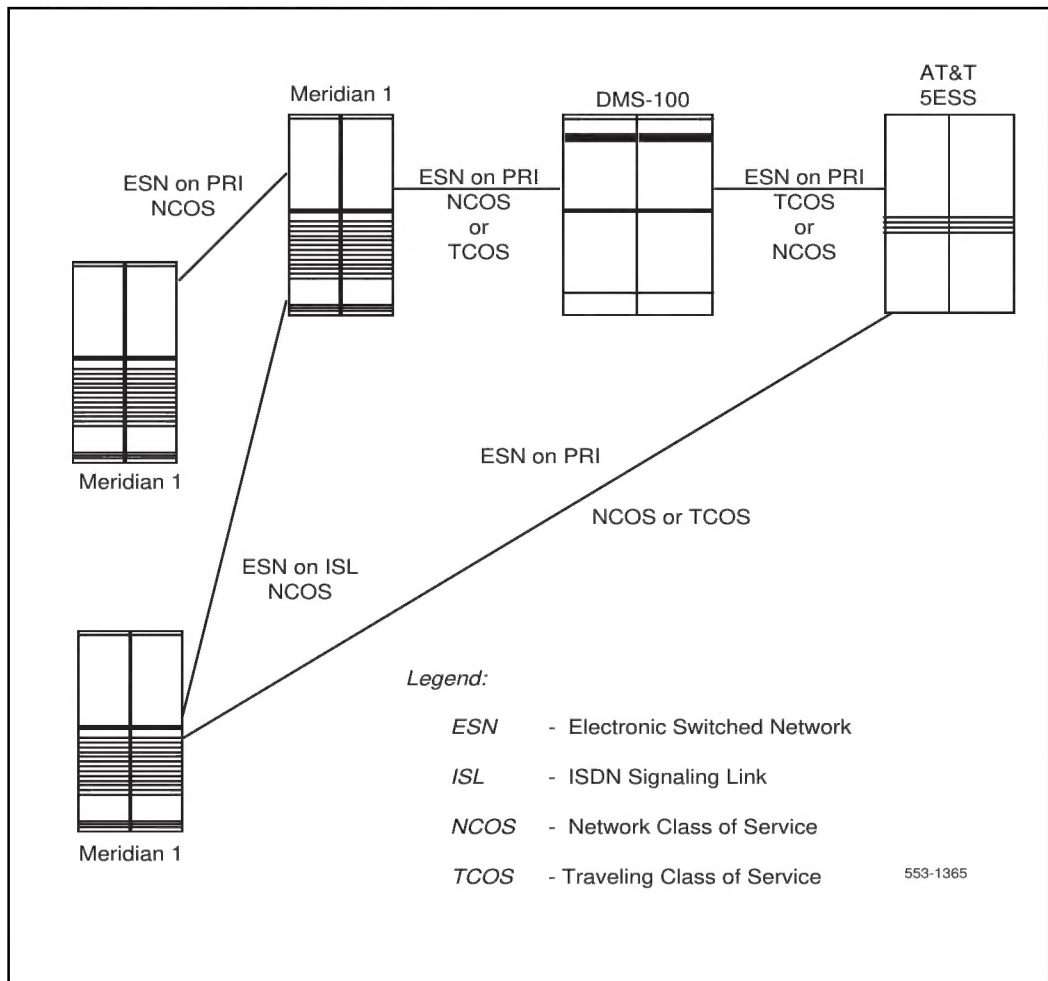
**Figure 29**  
**INAC configuration rules**



**Table 38**  
**ESN features available with ISDN**

| ESN features                                                                                          | X11 Release 21 ISDN |
|-------------------------------------------------------------------------------------------------------|---------------------|
| Network Class of Service                                                                              | yes                 |
| Network Control                                                                                       |                     |
| —NCOS                                                                                                 | yes                 |
| —TCOS (ETN)                                                                                           | yes                 |
| Network Alternate Route Selection                                                                     |                     |
| —NARS Access Codes                                                                                    | yes                 |
| —Time of Day Routing                                                                                  | yes                 |
| —Network Routing Controls                                                                             | yes                 |
| —Satellite Link Control                                                                               | yes                 |
| —Digit Screening                                                                                      | yes                 |
| —Digit Manipulation                                                                                   | yes                 |
| —Auto on-net to off-net overflow                                                                      | yes                 |
| —Automatic Least Cost Routing                                                                         | yes                 |
| —Network Speed Call                                                                                   | yes                 |
| —Automatic OCC Access                                                                                 | yes                 |
| —Expensive Route Warning Tone                                                                         | yes                 |
| ESN Queuing                                                                                           |                     |
| Local queuing                                                                                         |                     |
| —Off-hook queuing                                                                                     | yes                 |
| —Call back queuing                                                                                    | yes                 |
| Network Queuing                                                                                       |                     |
| —Coordinated Call Back Queuing                                                                        | yes (Note)          |
| —Coordinated Call Back Queuing to Conventional Main                                                   | yes (Note)          |
| —Remote Virtual Queuing                                                                               | yes                 |
| Network Authorization Codes                                                                           | yes                 |
| Coordinated Dialing Plan for up to 10 digits                                                          | yes                 |
| Network Call Transfer                                                                                 | no                  |
| <b>Note:</b> CCBQ and CCBQCM are available with Remote Virtual Queuing with X11 release 18 and later. |                     |

**Figure 30**  
**ESN capability in the ISDN network**



## Feature implementation

### ESN default call types

When an ISDN call is made, a default Electronic Switched Network (ESN) call type is set initially. The call type is set depending on the dialing method used (that is, how the call is made). Table 39 shows the ISDN default call types. Procedure 14 describes how to define the default call types.

**Note:** When a trunk access code is used to dial on an ISDN route, the caller dials all digits without waiting for subsequent dial tones.

**Table 39**  
**Default Call Types**

| Dial method   | Default call type              | Comment                               |
|---------------|--------------------------------|---------------------------------------|
| Direct dial   | UKWN (unknown)                 | Direct dial to trunks via access code |
| CDP (DSC/TSC) | CDP (Coordinated dialing plan) | Dial CDP number via DSC/TSC code      |
| CDP (LSC)     | UKWN                           | Dial CDP number via LSC code          |
| ESN (LOC)     | LOC (location code)            | Dial NARS location code               |
| ESN (HLOC)    | UKWN                           | Dial ESN HLOC number                  |
| ESN (NPA)     | NPA (national)                 | Dial ESN NPA number                   |
| ESN (NXX)     | NXX (local)                    | Dial ESN NXX number                   |
| ESN (SPN)     | SPN (special number)           | Dial ESN SPN number                   |

**Procedure 14**

**Respond to the following prompts in LD 86**

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| Prompt | Response | Description                                                                                                        |
|--------|----------|--------------------------------------------------------------------------------------------------------------------|
| REQ    | NEW, CHG |                                                                                                                    |
| CUST   | 0–99     | Enter customer number                                                                                              |
| FEAT   | DGT      | Digit manipulation data block                                                                                      |
| DMI    | 1–255    | Digit manipulation table index numbers for NARS/BARS                                                               |
| CTYP   |          | Call type. Enter the call type to the manipulated digits. This call type must be recognized by the far end switch. |
|        | (NCHG)   | The call type will not be changed                                                                                  |
|        | INTL     | Special number in international format                                                                             |
|        | NPA      | NPA                                                                                                                |
|        | NXX      | NXX                                                                                                                |
|        | LOC      | Location Code                                                                                                      |
|        | CDP      | Coordinated Dialing Plan                                                                                           |
|        | SPN      | Special number                                                                                                     |
|        | UKWN     | Unknown call type                                                                                                  |

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## ESN access code insertion

Procedures 15 and 16 describe how to automatically insert the needed NARS/BARS access code to the incoming digit stream. This is required for ISDN networking features such as Network Ring Again (NRAG) and Network Message Services (NMS).

ESN access code insertion is performed in the receiving switch either by the INST or INAC option in LD 16. The INAC option is recommended. In other words, the called number may go through ESN digit manipulation, which must not include the ESN access code in the sending switch. This rule applies to systems with X11 release 15 and higher.

### Procedure 15 Enable INAC option in LD 16

| Prompt | Response      | Description                                                                                                                                                                                                                                       |
|--------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REQ    | NEW, CHG, END |                                                                                                                                                                                                                                                   |
| TYPE   | RDB           | Route data block                                                                                                                                                                                                                                  |
| INAC   | (NO), YES     | Insert Access Code. Permit an ESN access code to be automatically added to an incoming ESN call from a private network. If INAC is YES, the digit insertion option (INST) is bypassed. This prompt only appears if the route type is a tie trunk. |

**Procedure 16****Map NARS/BARS access code to the incoming call types in LD 15**

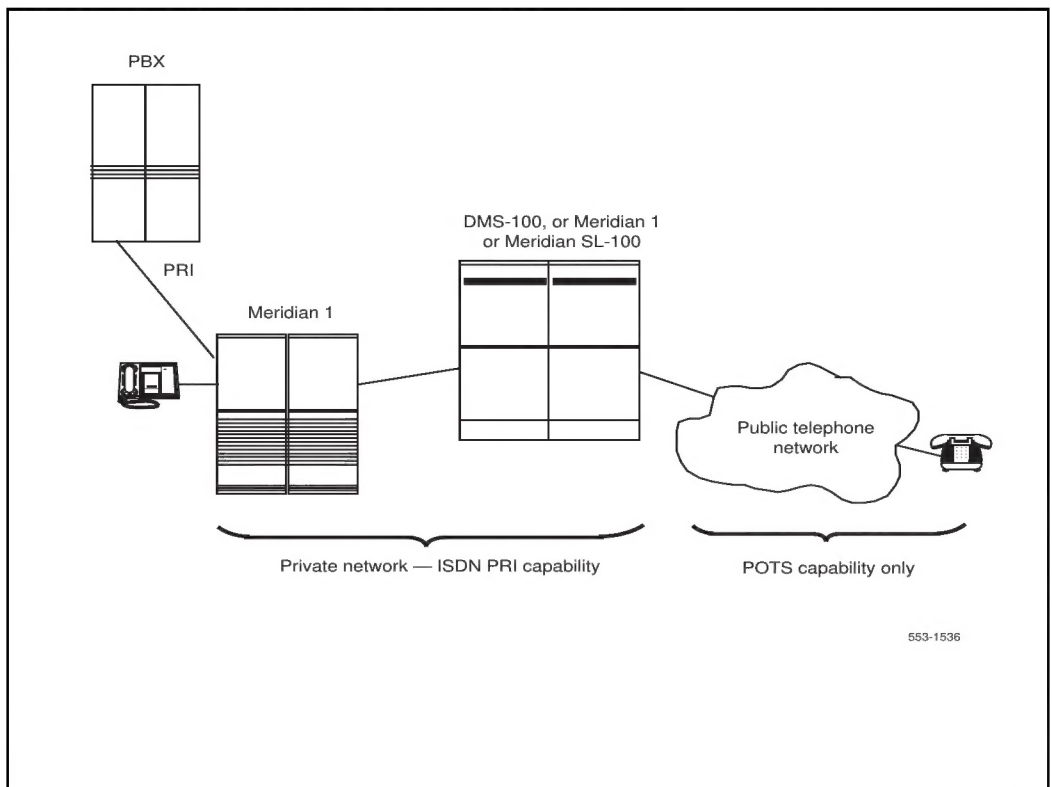
| Prompt | Response         | Description                                                                                                                                                                                                                                                                              |
|--------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| REQ    | NEW, CHG,<br>END |                                                                                                                                                                                                                                                                                          |
| TYPE   | CDB              | Customer data block                                                                                                                                                                                                                                                                      |
| AC2    |                  | Access code 2. Enter call types (type of number) that use access code 2. Multiple responses are permitted. If a call type is not entered here, it is automatically defaulted to access code 1.                                                                                           |
|        | NPA              | E.164 National                                                                                                                                                                                                                                                                           |
|        | NXX              | E.164 Subscriber                                                                                                                                                                                                                                                                         |
|        | INTL             | International                                                                                                                                                                                                                                                                            |
|        | SPN              | Special number                                                                                                                                                                                                                                                                           |
|        | LOC              | Location code                                                                                                                                                                                                                                                                            |
| ISDN   | YES              |                                                                                                                                                                                                                                                                                          |
| PNI    | 1–32700          | Customer private identifier—unique to a customer. Within one network, use the same value for PNI in both the Customer Data Block (LD 15) and the Route Data Block (LD 16). For different customers, the PNI in LD 15 should match the PNI in LD 16 at the far end switch (M1/SL-1 only). |

## Private Network Hopoff

Private Network Hopoff is provided by the ESN feature. Private Network Hopoff allows ISDN callers to use the private network to complete public calls. The call is routed through the private network as far as possible before “hopping off” onto the public lines (see Figure 31).

Users select this service, on a per call basis, by dialing the private network facilities prefix digit, followed by the public network number. For example, the number 9 is often used as a private network facilities prefix digit before dialing a local number.

**Figure 31**  
**Private Network Hopoff**



## Private Network Overflow

This service allows overflow from a private network onto public network facilities (see Figure 32). On outgoing calls over a DMS-100 PRI connection, the DMS provides network overflow when all of a customer's private trunks are busy.

For outgoing calls that encounter blocking (all B-channels are busy), the network provides the capability to overflow to alternate trunks. This is provided by the Electronic Switched Network (ESN) feature. This access can be restricted using a trunk or set class of service.

**Figure 32**  
**Private Network Overflow**

